KAISER•HILL
COMPANY

CORRES. CONTROL OUTGOING LTR. NO.		
DOE ORDER #		
01-RF-02277		
DIST.	LTR	ENC
BRAILSFORD, M.D	X	
BURNS, T.F.		
CARD, R.		
FERRERA, D.W.		
FERRI, M.S.		
FULTON, J.C.		
GIACOMINI, J..		
HALL. L		
ISOM, J.H.		
MARTINEZ, L.A.		
MOTES, J.L.		
PARKER, A.		
POWERS, K.		
RAAZ, R.D.		
SCOTT, G.K.		
SHELTON, D.C.		
SPEARS, M.S.		
TRICE, K.D.		
TUOR, N.R.		
VOORHEIS, G.M.		
BERARDINI, J.	X	X
GEIS, A.	X	
SHELTON, D	X	
FERRI, MARK	X	
RODGERS, A.	X	
NORTH, K.	X	
NESTA, S.	X	
GILBREATH, C	X	
ARNOLD, P.	X	
HOPKINS, T.	X	
CORRES.CONTROL	X	X
ADMIN RECRD/460		
TRAFFIC		
PATS/T130G		
CLASSIFICATION:		
UCNI		
UNCLASSIFIED	X	X
CONFIDENTIAL		
SECRET		
AUTHORIZED CLASSIFIER SIGNATURE:		
Date: 9/25/01		
IN REPLY TO RFP CC NO.:		
ACTION ITEM STATUS: ☐ PARTIAL/OPEN ☐ CLOSED		
LTR APPROVALS: 1/41		
ORIG. & TYPIST INITIALS: JHB : vmb		

September 25, 2001 01-RF-02277

Mr. Fred Dowsett,
Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division B-2
Compliance Coordinator
4300 Cherry Creek Drive South
Denver, CO 80246-1530

CHARACTRIZATION OF ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE (SITE) GLOVEBOXES – JHB-011-01

Dear Mr. Dowsett:

The Site has characterized gloveboxes (GBs), as described below, to be non-hazardous waste. The Site requests your concurrence with this determination. The basis for the Site's analysis is twofold: first, a determination that the monolithic waste form, as disposed, does not exhibit a characteristic of hazardous waste in relation to the regulatory criteria; second, that the waste form as disposed falls below the regulatory threshold for lead (5 mg/L).

Safety Considerations. Significant levels of plutonium contamination (primarily alpha radiation) are known to remain within GBs, even after extensive decontamination efforts. Removal of leaded components from gloveboxes exposes decontamination and decommissioning (D&D) workers directly to these contamination hazards, prolongs exposure to external radiation sources in the work area, and presents serious potential for industrial injury. These potential radiation exposures are especially significant in relation to removal of windows, which cannot be accomplished without a substantial breach of the containment of alpha contamination otherwise provided by the GB. These potential exposures to radiation hazards should be avoided unless the environmental regulations *require* component removal. Therefore, because of these significant safety considerations, these GBs will not be further dismantled for disposal.

Description of Gloveboxes. Glovebox-equivalents are approximately 4' x 4' x 10' stainless steel carcasses[1], from which lead shielding has been removed but leaded glass windows remain intact in the stainless steel frame. (The stainless steel carcass, itself, contains no hazardous waste and no hazardous constituent.) It weighs approximately 1,650 pounds, including windows. GBs contain various ports, which house gloves and plastic, tape or metal covers. On average, six leaded glass windows are attached

[1] Many GBs are larger than this originally; however, large boxes will be cut to this size to fit inside of cargo containers for transportation and disposal. For planning and discussion purposes, these are referred to as "GB-equivalents". The number and size of windows is variable; for characterization purposes, nominally a GB-equivalent will contain six leaded glass windows, each weighing approximately 20 pounds.

in the stainless steel frame, encased in a rubber gasket. The windows are approximately 1.5 cm thick, consisting of two outer plates of non-lead bearing soda/safety glass (3.0 mm each) surrounding an inner layer of leaded glass (7.3 mm). These were manufactured as a single piece of glass and are not separable plates.

Gloveboxes, as disposed, may contain additional leaded components, but only if the total mass balance calculation for lead in the particular GB as disposed is below the regulatory threshhold. (See discussion, below.)

Criteria for Identifying the Characteristics of Hazardous Waste. The regulatory criteria for identifying hazardous characteristics are informative. 6 CCR 1007-3 § 261.10 establishes the criteria as:

> (1) A solid waste that exhibits the characteristic may:
> (i) Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
> (ii) Pose a substantial present or potential hazard to human health or the environment when it is improperly treated, stored, transported, disposed of or otherwise managed.

Although not directly pertinent because toxicity has already been established as a characteristic for hazardous waste, the rationale underlying the regulatory criteria is instructive. The gloveboxes, as disposed, do not meet these criteria: the leaded component of the GB will not cause or present a hazard to human health or the environment. This statement is based upon the structural integrity of the glass as well as the physical composition of the glass, and the low bioavailability of lead in this form. See report of Structural Integrity Test[2], Attachment 1, Southwest Research Institute, September 4, 2001, which reports that only debris and small pieces of the *exterior* safety glass broke apart from the "monolithic" window. See also, Attachment 2, Laboratory Report, Dr. John W. Drexler, Laboratory For Environmental and Geological Studies, University of Colorado, August 14, 2001 for greater detail about the physical composition of the window, its low potential for leaching and the low relative bioavailability of lead in this form. (In fact, Dr. Drexler's findings indicate that lead in this waste form (at particle sizes $\geq$ 1.0 g) would be less bioavailable than lead in mining overburden (slag) which has been exempted from the definition of hazardous waste.)

Furthermore, it is worth noting that the management of these GBs, if disposed as low level waste, would be accomplished in accordance with the requirements for disposal of other low-level radioactive wastes at a facility operated by the United States Department of Energy. Thus, any concern for a mismanagement scenario is minimal.

The second criteria for determining a hazardous characteristic, 6 CCR 1007-3, § 261.10 is:

> (2) A characteristic can be:
> (i) Measured by an available standardized test method which is reasonably within the capability of generators of solid waste or private sector laboratories that are available to serve generators of solid waste; or
> (ii) Reasonably detected by generators of solid waste through their knowledge of their waste.

---

[2] The EP Toxicity Test provided a method to determine sample sizes for "monolithic wastes". It required leaching pieces of the "monolith" that were broken away in the course of a Structural Integrity Test. Although the Structural Integrity Test is not specifically authorized by current regulation, it provides an objective basis for evaluating the structural strength of the GB windows.

As discussed below, the reason characterization of this particular waste is so laborious is that it cannot be measured by an available standardized test method.

The Glovebox-equivalents fall below the regulatory threshold for lead (5 mg/L).

The gloveboxes cannot be directly measured by a standardized test method. Thus, the basis for a waste characterization is, of necessity, based upon the best available information, namely a combination of process knowledge and analytical data. Based upon the full range of available information, the gloveboxes, as generated, fall below the regulatory threshold for lead (5 ppm). They are not hazardous waste, accordingly.

The Toxicity Characteristic Leaching Procedure (TCLP) is the analytical methodology authorized by regulation for assessment of the toxicity characteristic, 6 CCR 1007-3 §§ 262.11(c)(1), 261.24(a). The determination whether a waste is hazardous for toxicity is based upon leaching the "extract from a *representative sample of the waste*". The generated waste is a glovebox-equivalent, namely 1650 pounds of stainless steel including 120 pounds of glass as an integral part of the assembly. Because of the nature of the waste stream, one cannot size-reduce and take a representative sample. Therefore, TCLP analysis cannot be performed on the waste. Even if a TCLP *could* be run on this waste, it would not provide an accurate representation of the waste as disposed.

A representative sample of this waste form, as generated, cannot be selected because the GB-equivalent will be disposed intact as a monolith. Due to the monolithic nature of the waste for disposal a basis for waste characterization other than TCLP is warranted.

As an alternative to a TCLP evaluation, the use of process knowledge for waste characterization is authorized, 6 CCR 1007-3 § 262.11(c)(2), 40 CFR §262.11(c)(2). In this instance, the Site's process knowledge includes a combination of information about the waste form itself and various analyses which have been conducted to provide the best evidence of the window's characteristics. This information provides a basis for characterization of the waste as generated, i.e., the GB. First, the Site's process knowledge of these gloveboxes includes knowledge about the physical composition of the glass and knowledge that lead is physically bound up in the chemical structure of this glass, presenting a low potential for leaching. See Attachments 1 and 2. Second, leach results from a variety of samples of the leaded glass windows are available. (Note: these results are not presented as an alternative methodology, but as acceptable process knowledge about the waste form as generated, i.e., a GB containing windows which have strong structural integrity.)

A leach test of an entire glovebox window (glass only) was conducted, following the TCLP procedure in all respects except size reduction (Samples 1 and 2). Leach results from entire windows are representative of this component of the waste because it is it is not anticipated that the windows will break apart in a disposal environment. (See Attachment 1) The same samples (glass only) were leached for a second 24-hour period (Samples 3 and 4). Another representative window (entire *new* glass *plus* rubber gasket) was leached, in accordance with the TCLP protocol except as to size reduction (Samples 5 and 6). Another representative window (entire *old* glass *plus* rubber gasket) was leached, in accordance with the

TCLP protocol except as to size reduction (Samples 7 and 8). A bioavailability leach test[3] was conducted by Dr. Drexler of a 1.0-cm particle size (Sample 9).

Sample 9 presents the worst reasonably anticipated case as it is based upon a 1.0 cm fragment size. The analytical results from the other window samples reasonably bracket the amount of lead one would expect to leach from the window and, therefore, from the glovebox itself.

The following formula is used to calculate the mass balance of lead in a GB-equivalent.

$$\frac{\langle 120\ pounds\ of\ gloveboxglass\rangle}{\langle 1530\ pounds of\ glovebox + 120\ pounds\ of\ gloveboxglass\rangle} \times x\ mg/L\ Pb = y\ mg/L\ Pb\text{he}$$

The analytical results and mass balance calculation for each sample are summarized as follows[4]:

	Analytical Value for Pb (mg/L)	Mass Balance Calculation of Pb (mg/L)		Analytical Value for Pb (mg/L)	Mass Balance Calculation of Pb (mg/L)
Sample 1	50 ppm	3.6363	Sample 6	0.1 ppm	0.0073
Sample 2	49 ppm	3.5636	Sample 7	2.8 ppm	0.2036
Sample 3	24 ppm	1.7454	Sample 8	2.7 ppm	0.1964
Sample 4	27 ppm	1.9636	Sample 9	14.5 ppm	1.0545
Sample 5	0.3 ppm	0.0218			

All mass balance calculations (excluding Sample 9 for the reasons noted above) fall below the regulatory threshold for lead (5 mg/L). Samples 5 through 8 present the best evidence of the waste characterization of GB-equivalents, as those results are derived from windows that most closely match the physical form of the waste as generated. Thus, the GB-equivalent, as disposed, is not a hazardous waste.

If a particular GB, as generated, contains leaded components that are significantly different from the described GB-equivalent, a mass balance calculation will be required that evaluates all leaded components; if below the regulatory threshold in accordance with this manner of calculation, the GB will be characterized as non-hazardous waste.

Conclusion.

The Site has concluded that the described glovebox-equivalents are not hazardous waste. This conclusion is based upon the rationale underlying the criteria for determining hazardous waste characteristics. It is also based upon a combination of process knowledge and analytical information about the characteristics of the leaded glass windows when disposed as a part of the glovebox-equivalent. A mass balance calculation of lead in the glovebox-equivalent waste form yields results below the regulatory threshold for

---

[3] Dr Drexler's Simplified Bioaccessibility Test (more fully described in Attachment 2) is functionally equivalent to the EPA Region VIII Swine Test Method. (This method assesses how much lead will be absorbed if a human directly ingests the material). By this methodology, a sample of the GB glass was prepared with a size of > 1 cm (coarse sample) and subjected to an extraction fluid of HCl (pH 1.5) at 98 degrees for one hour.

[4] Analytical data for samples 1 through 8 is provided as Attachment 3. Dr. Drexler's report regarding sample 9 is provided as Attachment 2.

lead (5 mg/L). This demonstrates that glovebox-equivalents are not a hazardous waste. As such, the Site intends to seek approval for disposition of glovebox-equivalents as low level waste without further dismantling. Similarly, the Site will perform mass balance calculations to characterize gloveboxes that differ from the GB-equivalent; and if non-hazardous, approval for disposition of these as low level waste will be sought.

The Site requests your concurrence that the glovebox-equivalents are not hazardous waste.

Sincerely,

Jacqueline H. Berardini
Material Stewardship,
Environmental Manager
Kaiser-Hill Company, LLC

JHB:vmb

Attachments:
As Stated

cc:
James Hindman - CDPHE
Joe Legare - DOE-RFFO

SOUTHWEST RESEARCH INSTITUTE

6220 CULEBRA ROAD • POST OFFICE DRAWER 28510 • SAN ANTONIO, TEXAS 78228-0510, USA • (210) 684-5111 • WWW.SWRI.ORG

Chemistry and Chemical Engineering Division
Department of Analytical and Environmental Chemistry

ENTERED 9-7-01

RECEIVED
SEP 5 2001

September 4, 2001

Mr. Pat Preese

Kaiser-Hill Company, LLC – Analytical Services
Rocky Flats Environmental Technology Site
Building T130C
State Highway 93 and Cactus Road
Arvada, CO 80007

Subject:	Narrative	
	RIN:	01C0207
	Purchase Order:	DAD01ANA
	SDG Number:	166635
	SwRI Project Number:	01.04756.01.006
	SwRI Work Order Number:	20806
	Samples Received:	August 23, 2001

Dear Mr. Preese,

Enclosed please find the analytical data for the above referenced project.

If you should have any questions, please do not hesitate to call me at (210) 522-2356.

Sincerely,

Mike Dammann
Manager

APPROVED:

Reza Karimi, Ph.D.
Director

MD:mar

SAMPLE DATA PACKAGE COVER PAGE

1. **Laboratory Name: Southwest Research Institute**
2. **Laboratory Code: SwRI**
3. **Report Identification Number: 01C0207**
4. **Laboratory Report Identification: #001**
5. **Line Item Codes: TR01A251**
6. **Site Sample Numbers:**

SwRI ID	Customer ID	SwRI ID	Customer ID
166635	01C0207-1	166636	01C0207-2

7. **Sample Matrix: Solid**

SOUTHWEST RESEARCH INSTITUTE
CLIENT: KAISER HILL
WORK ORDER: 20806
SDG: 166635(01C0207-1)
VTSR: AUGUST 23, 2001
PROJECT#: 01.04756.01.006

NARRATIVE

CLIENT:KAISER HILL
PROJECT NO. 04756.01.006
SDG: 166635
PAGE 1

000001

1. Two (2) solid samples were submitted for Metals analysis:

SwRI ID	Customer ID	SwRI ID	Customer ID
166635	01C0207-1	166636	01C0207-2

2. Samples were received at SwRI on August 23, 2001, for a fourteen (14) day hardcopy turnaround time from Validated Time of Sample Receipt (VTSR).

METALS ANALYSIS

Testing of samples was done in accordance of 1310A section 7.10 Structural Integrity Procedure.

The test apparatus used was identical with the method except that the bottom holder was modified for the length and shape of the test specimens. The elastimeric material was also not placed all the way to the top of the specimen (see attached photos and table) to allow the hammer full access to the top of the glass.

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Director or his designee, as verified by the following signature. This report shall not be reproduced except in full, without the written approval of SwRI."

J. Ann Boyd — 9/04/01

Jo Ann Boyd,
Manager, Quality Assurance Unit

Date

9

SOUTHWEST RESEARCH INSTITUTE
CLIENT: KAISER HILL
WORK ORDER: 20806
SDG: 166635(01C0207-1)
VTSR: AUGUST 23, 2001
PROJECT#: 01.04756.01.006

CHAIN OF CUSTODY

10

Enabling Technology, Inc **RFETS**	**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**	C.O.C. # 01C0207#001 Page 1 of 1

Sampler(s) Conrad Trice (time/date)	Contact/Requester TRICE, CONRAD/BOB CATHEL	Telephone No. 2490/6880
RIN 01C0207	Sampling Origin B776/777	Purchase Order/Charge Code DAD01ANA
Project Title B776/777 LEADED GLASS BLOCKS	Logbook No. N/A	Ice Chest No. N/A Temp.
To (Lab) Southwest Research	Method of Shipment ~~Hand Carry~~ Fed EX	Bill of Lading/Air Bill No.
Protocol	Related COC (if any)	PRE ~~N/A~~ 010822-T130C-003

POSSIBLE SAMPLE HAZARDS/REMARKS
Are acid preserved samples DOT hazardous per 40 CFR Part 136.3 Table II? YES or NO
Are other known hazardous substances present? YES or NO
** ** **

SCREENING REQUIRED ☐

SPECIAL INSTRUCTIONS Hold Time
NOTE: CUT THE LARGER PIECE OF GLASS THE SAME LENGTH AS THE SMALLER PIECE OF GLASS PRIOR TO RUNNING TEST.

Bottle No.	Customer Number	Matrix	Date	Time	Location	Container (size/type/quantity)	Sample Analysis	Preservative ; Packing
01C0207-001.001	1	SOLID	8/22/01	11:00	B776/777	1-SAMPLE / N/A /1	TR01A251 (Leaded Glass Structural Integrity Test) [Rush]	None None
01C0207-002.001	2	SOLID	↓	↓	B776/777	1-SAMPLE / N/A /1	TR01A251 (Leaded Glass Structural Integrity Test) [Rush]	None None

thc 8/22/01

Relinquished By:	Date/Time	Received By:	Date/Time	Relinquished By:	Date/Time	Received By:	Date/Time
Conrad Trice	8/22/01 11:50	M Christman	8/22/01 1150	M Christman	8/22/01 1500	Fed Ex	

FINAL SAMPLE DISPOSITION Disposal Method (e.g., returned to customer, disposed of per lab procedure, used in analytical process) Disposed By Date/Time

Joe Marit 8/23/01 - 09:1

00002

11

SAMPLE LOG-IN SHEET

000003

Lab Name: Southwest Research Institute

Page 1 of 1

Received By (Print Name): Joe Morin JR

Log-in Date: 08/23/2001

Received By (Signature): Joe Morin

Case Number: 01C0207

Sample Delivery Group No.: 166635

SAS Number: N/A

Remarks: 04756.01.006

1.	Custody Seal(s)	Present/Absent* Intact/Broken
2.	Custody Seal Nos.	N/A
3.	Chain-of Custody Records	Present/Absent*
4.	Traffic Reports or Packing Lists	Present/Absent*
5.	Airbill	Airbill/Sticker Present/Absent*
6.	Airbill No.	453321277660
7.	Sample Tags	Present/Absent*
	Sample Tag Numbers	Listed/Not listed on Chain of Custody
8.	Sample Condition	Intact/Broken*/ Leaking
9.	Cooler Temperature	22C
10.	Does Information on custody records, traffic reports, and sample tags agree?	Yes/No*
11.	Date Received at Lab	08/23/2001
12.	Time Received	09:10:00

EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
01C0207-1	NONE	166635	INTACT
01C0207-2	NONE	166636	INTACT

Sample Transfer

Fraction: See ATTached	Fraction:
Area #: IVORC-1	Area #:
By:	By: 8/23/01
On: 8/23/01	On:

* Contact SMO and attach record of resolution

Reviewed By:

Date: 8/23/01 - 13:05

Logbook No.: Work Order (20806)

Logbook Page No.: 4077 (section 202)

FORM DC-1

OLMO4.2

12

SOUTHWEST RESEARCH INSTITUTE
CLIENT: KAISER HILL
WORK ORDER: 20806
SDG: 166635(01C0207-1)
VTSR: AUGUST 23, 2001
PROJECT#: 01.04756.01.006

METALS ANALYSIS

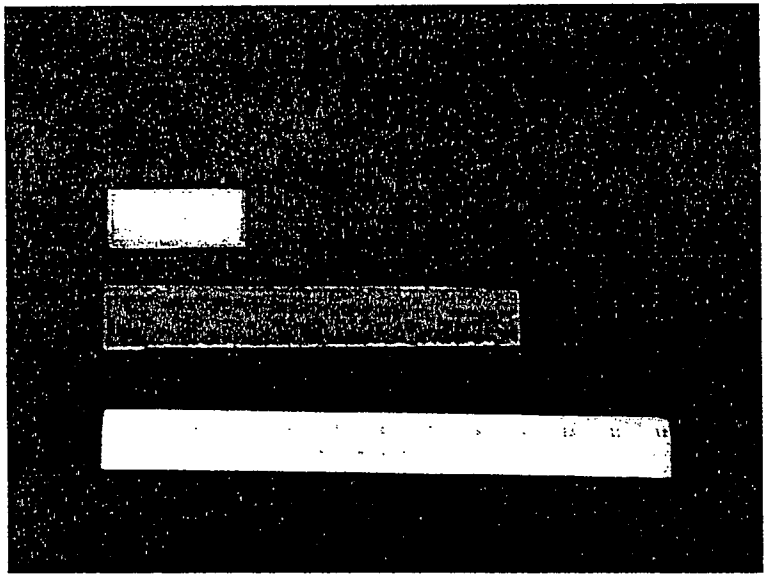

Figure 1 - A picture of both samples, Client ID: 01C0207-1 (short), 01C0207-2 (long) prior to testing "as received"

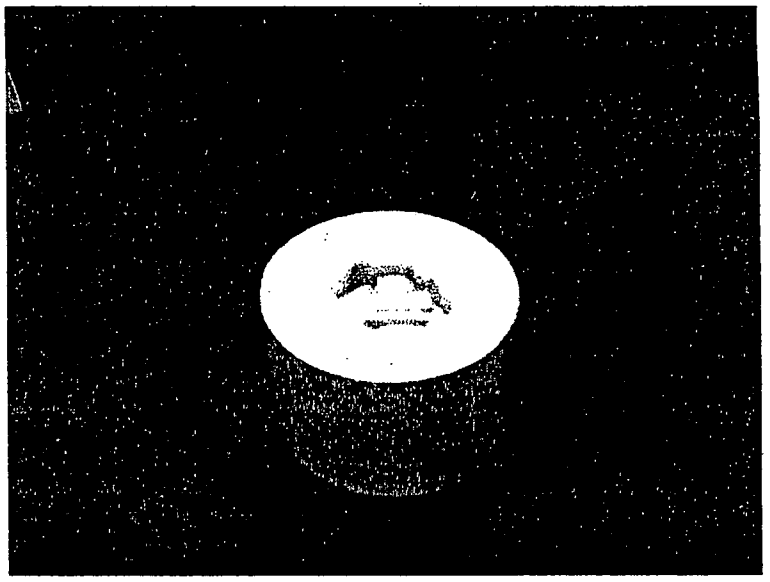

Figure 2- A picture of the short sample, SwRI Lab ID 166635, in the bottom portion of the test jig.

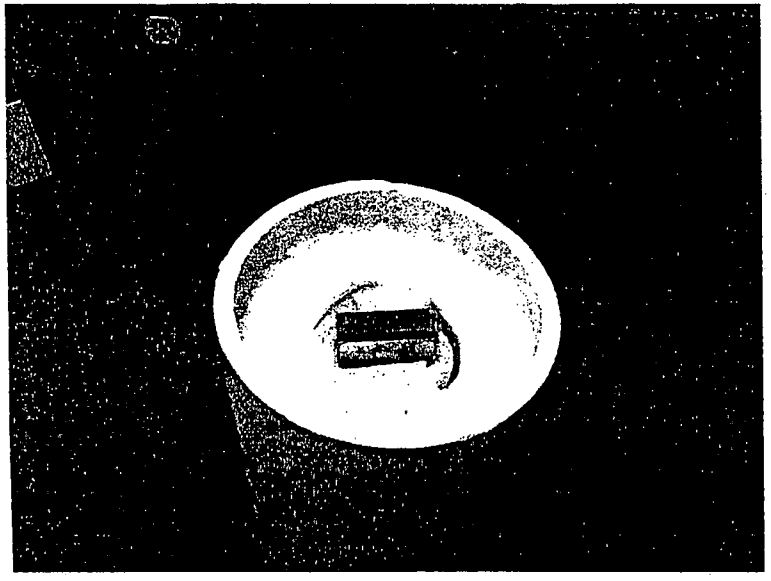

Figure 3 - A picture of the long sample, SwRI Lab ID 166636, in the bottom portion of the test jig.

Figure 4 - A picture of the short sample after testing and the associated loose material generated during the test.

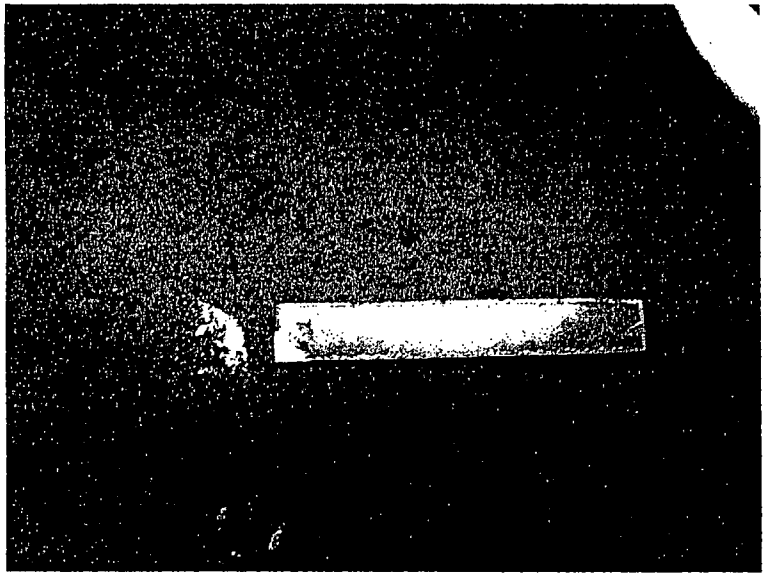

Figure 5 - A picture of the long sample after testing and the associated loose material generated during the test.

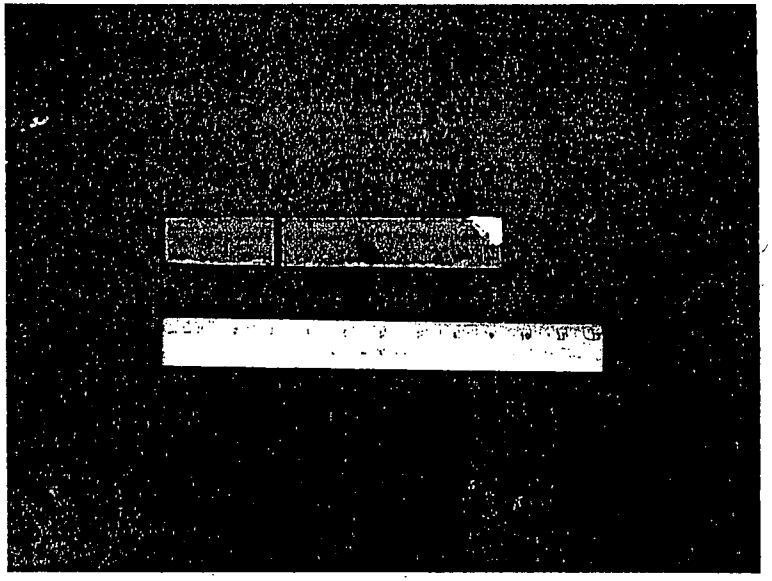

Figure 6 - A picture of the long sample after being cut into two pieces, the shorter one the same length as the short sample.

Figure 7 - A picture of the cut sample in the bottom portion of the test jig.

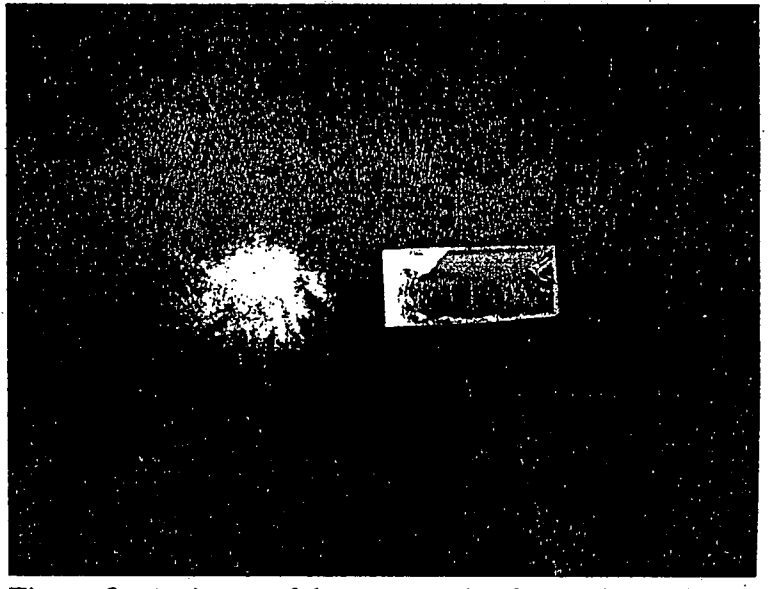

Figure 8 - A picture of the cut sample after testing and the associated loose material generated during the test.

Kaiser Hill
Project # 01.04756.01.006

September 4, 2001
Southwest Research Institute

Testing in Accordance of 1310A section 7.10 Structural Integrity

Customer ID	SwRI Lab System ID	Weight Before	Weight after test	Loose sample after test
01C0207-1	166635	115.9228 gm	115.6379 gm	0.2841 gm
01C0207-2	166636	368.43 gm	367.39 gm	1.0311 gm
01C0207-2 (cut)	166636 (2 7/8")	116.1162 gm	113.5908 gm	2.5252 gm

010003

16

LABORATORY REPORT

Characterization of a Multi-Layer Glass Plate for Lead Bioaccessability and Bioavailability

For

Kaiser Hill Company

August 14, 2001

By

Dr. John W. Drexler
Laboratory for Environmental and Geological Studies
University of Colorado
Boulder, CO. 80309
(303) 492-5251

17

EXECUTIVE SUMMARY

The 1.5 cm thick glass plate consists of two outer plates of non lead-bearing soda glass surrounding an inner plate of leaded (~61 wt% Pb) glass. The lead is uniformly distributed within the vitrified material. Intact the plates, which compose the windows (whose edges are sealed by rubber gaskets) of several glove boxes, have a relative bioavailability for lead of less than 1%. Further, in this physical state they would have a very limited impact on groundwater systems. It is my opinion that the plates surface area size and physical structure make significant leaching of lead highly unlikely in a disposal environment.

INTRODUCTION

A sample of a multi-layered glass plate, used in glove boxes at the Rocky Flats Environmental Technology Site, was delivered to the laboratory for lead speciation and invitro bioavailability. s/b 7.3 mm The plated glass is composed of a 73mm layer thick leaded glass bonded between two 30 mm thick layers of lead-free glass, Figure s/b 3.0 mm

1. A representative split of each layer was collected for the invitro bioassay and a polished cross section was prepared for EMPA analyses.

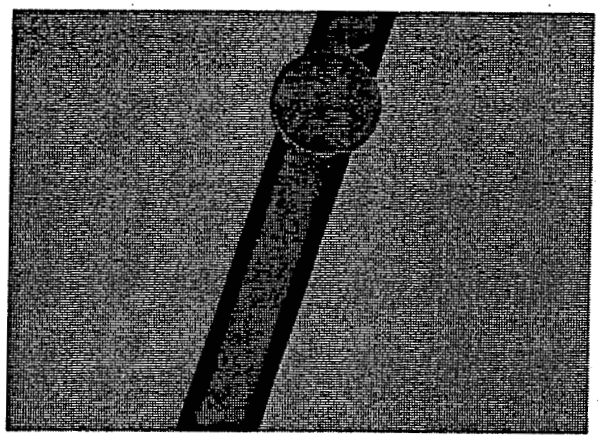

Figure 1. Cross section of multi-layer glass plate. The two dark-green outer plates are lead free and the inner (light green) plate contains approximately 61 wt% lead.

METHODS

Speciation

Lead speciation was conducted on a JOEL 8600 electron microprobe (EMPA) at the Laboratory for Geological Studies at the University of Colorado following the laboratory's SOP. Representative backscatter photomicrographs (BSPM) and x-ray "dot maps" illustrating sample characteristics were acquired. Major elemental analyses were conducted following standard EMPA techniques using certified standards. Accuracy is evaluated on counting statistics and standard reproducibility and reported as minimum detection limits (MDL), Tables 1 and 2.

INVITRO PROCEDURE

Evaluation of bioavailabilty, visa vi gastrointestinal adsorption, was conducted using the method developed at the University of Colorado, Boulder and calibrated to EPA's Region VIII Swine Model Drexler, 1997, Drexler, 1998, and Drexler et.al., 2002. The method has a high level of correlation to the Swine Model for lead (r=0.96).

The method follows a carefully designed laboratory SOP, which is

available on request. The procedure uses 1.0 grams of the <250μm size fraction. This material is placed in 125ml wide-mouth HDPE bottles along with 100ml of 1.5 pH extraction solution. The mixture is rotated end-on-end at 37°C in a water bath for one hour. After one hour 10ml of sample is removed, filtered (0.45μm), and analyzed for lead following Method 6010B. Results from this extraction procedure are then used to calculate bioavailable lead from the bulk <250μm concentrations. Quality assurance for the invitro bioavailability procedure consists of:

Regent Blank 1:10
Bottle Spike 1:20
Blank Spike 1:20
Duplicate Sample 1:10
Matrix Spikes 1:10
LCS 1:20

Control limits and corrective actions are described in the QAPP.

DISCUSSION

Physical Form

Speciation of the lead form using EMPA revealed that the lead is homogeneously distributed within the glass structure, as is supported by a backscatter photomicrograph, and x-ray "dot map"

distributions of the same section, Figure 2 A and B, respectively. As a waste one could consider it to be vitrified. The leaded glass's bulk composition, Table 1, indicates it contains approximately 66 weight percent PbO, with additional SiO_2 (31%) and BaO (4%). **(NOTE: The lead in the glass does not occur chemically as lead oxide (PbO) but is found as Pb^{+2} ions acting as network modifying cations filling the large holes between each Si/O tetrahedron. The chemical formula for the glass is most likely $PbSi_2O_5$.)** Unlike slag (a waste-glass from smelting) this inner glass

A. B.

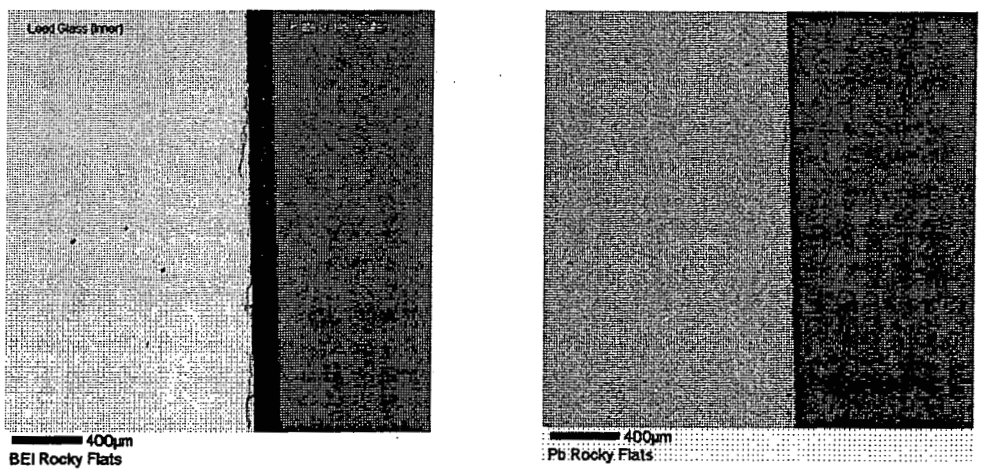

Figure 2. A) Backscatter photomicrograph of both the inner (leaded) and outer (lead-free) glass. B) X-ray "dot map" showing lead distribution in two glasses.

contains **NO** isolated forms of lead oxide, carbonate, or sulfide which can often increase their lead bioavailability. The lead atoms of this inner glass are forming links between silicon and oxygen tetrahedra, as depicted in Figure 3. Therefore lead migration (diffusion) will primarily be dependent on hydrogen diffusion into the glass structure. Glasses of this type are generally very resistant to leaching by water, less than 2% solubility (Haghjoo and McCauley, 1983), but can be readily attacked by acid media.

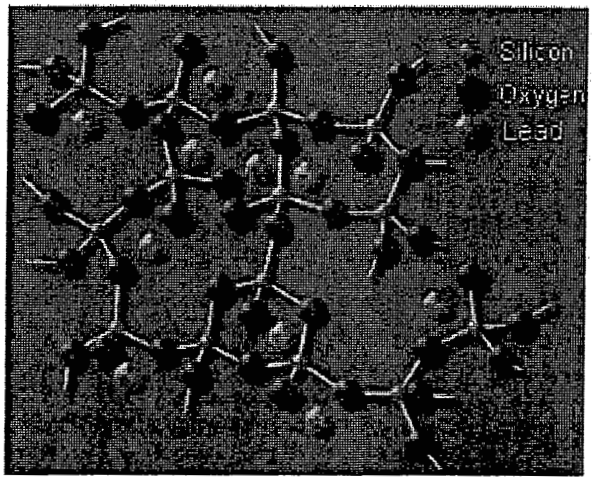

Figure 3. Schematic of leaded glass structure illustrating the lack of symmetry to the structure and the tetrahedral bonding. (Note the lead atoms would be significantly larger than those depicted in this figure).

Bioavailability

The outer glass has a bulk composition, Table 2, similar to most standard soda glasses. By definition, the bioavailable particle-size fraction of a waste is the <250 micron fraction. Therefore by definition, the intact plated glass would **not be bioavailable**. However, for this study, the bioassay was run on three separate sample splits formed by drastically reducing its particle size. The first two splits (one each of the outer and inner glasses) were ground to produce a particle-size fraction <250 microns (0.25mm). The third was a coarse split of the inner glass with particle size of > 1.0 cm. One should interpret these results as worst case. Bioavailability results listed in Table 3 indicate the inner (leaded) glass (at < 250 micron particle-size) has a 30% relative bioavailability (RBA), note that this is not significantly greater than that for the outer (standard, soda-glass, 20% RBA). As expected the RBA for the coarse split of the inner glass was significantly reduced to 0.2%.

For comparison, these results have been overlain on to the invivo results from the EPA Region VIII swine study, Figure 4. The Flats glass (at < 250 microns) would be considered to have low lead bioavailability, lying significantly below the EPA default of 60%

used in the IUBK model. (The fact that the glass is below the IUBK model default is only pointed out to illustrate its low bioavailability compared to many contaminated materials and that one could lower the models RBA factor, thus predicting lower blood leads in a given population.) At a particle size of 1.0 cm, the bioavailability is near zero.

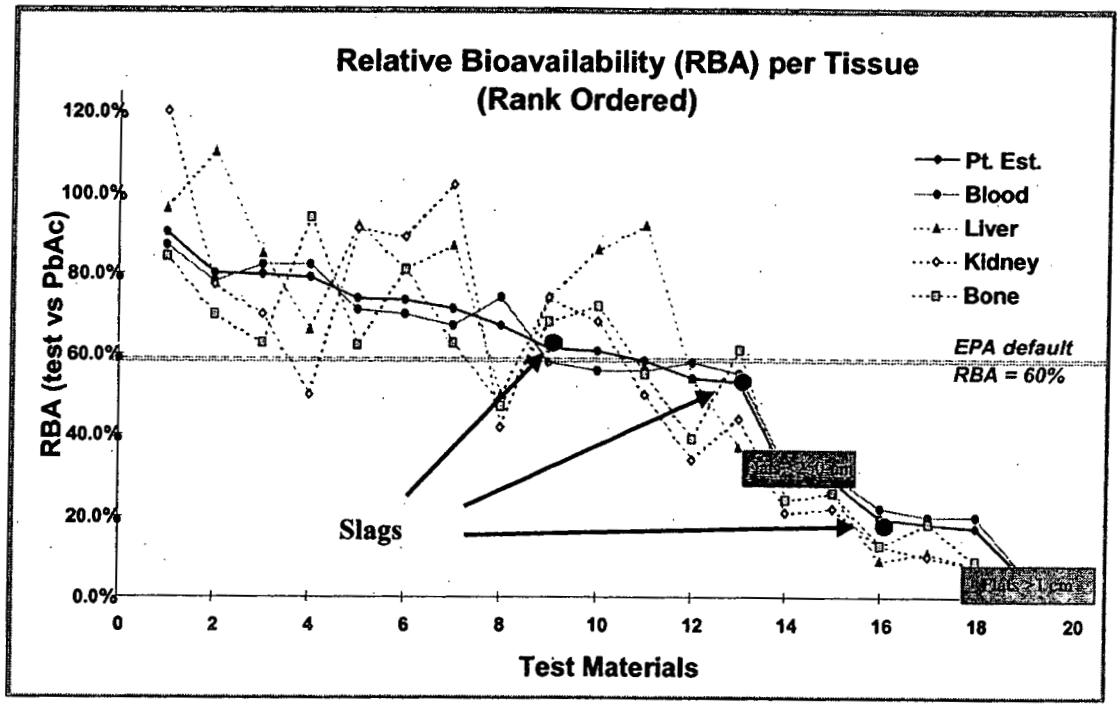

Figure 4. Comparison of Flats glass to other waste materials used in EPA Region VIII swine model.

References

Drexler, J.W., C. Weis, W. Brattin, M. V. Ruby, M. Goldade R. Schoof, G. Henningsen, and S. Christensen, 2002, Relative Bioavailability of Lead: A Validated In-Vitro Procedure, Submitted, Jour. Tox.

Drexler, J.W., 1997, Validation of an In Vitro Method: A tandem Approach to Estimating the Bioavailability of Lead and Arsenic to Humans, IBC Conference on Bioavailability, Scottsdale, Az.

Drexler, J.W., 1998, An In Vitro Method that works! A Simple, Rapid and Accurate Method for Determination of Lead Bioavailability. EPA Workshop, Durham, NC.

Manizhen H., and McCauley, R., 1983, Solubility of lead from ternary and quaternary silicate phases, Am Cer Soc Bull, V 62, 1256-1258.

Table 1. EMPA analyses of Inner glass.

	Oxide Wt%									
Pt#	**BaO**	**PbO#**	**TiO2***	**K2O**	**SiO2**	**Na2O**	**MgO***	**Al2O3**	**CaO***	**Total**
1	4.05	66.03	0.00	0.61	30.47	0.01	0.00	0.05	0.00	101.22
2	4.17	66.41	0.00	0.61	30.53	0.03	0.00	0.05	0.00	101.80
3	4.11	65.65	0.00	0.62	30.81	0.04	0.00	0.07	0.02	101.32
4	4.26	66.22	0.00	0.62	30.75	0.05	0.00	0.06	0.01	101.96
5	4.18	66.54	0.07	0.59	30.90	0.00	0.00	0.05	0.00	102.34
6	4.28	66.44	0.00	0.61	31.18	0.04	0.00	0.06	0.00	102.61
7	4.19	65.16	0.08	0.59	30.77	0.04	0.00	0.06	0.01	100.88
8	4.47	66.95	0.04	0.57	30.69	0.01	0.00	0.05	0.01	102.80
9	4.36	66.04	0.00	0.57	30.56	0.05	0.00	0.06	0.01	101.64
10	4.37	65.96	0.00	0.60	30.67	0.02	0.00	0.04	0.00	101.65
Average	4.24	66.14	0.02	0.60	30.73	0.03	0.00	0.06	0.01	101.82
St.Dev	0.1291	0.4989	0.0316	0.0185	0.2059	0.0177	0.0000	0.0080	0.0070	0.6173
MDL	0.1	0.17	0.12	0.02	0.05	0.00	0.02	0.02	0.03	

* Values below MDL. Results of ICP/MS analyses indicate 274, 18,303, and 44,510 mg/kg respectively

Note: The lead in the glass does not occur chemically al lead oxide (PbO), but is found as Pb+2 ions acting as network modifying cations filling large holes between each Si/O tetrahedron.

Table 2. EMPA analyses of Outer glass.

Oxide Wt%

Pt#	BaO**	PbO**,#	TiO2**	K2O	SiO2	Na2O	MgO	Al2O3	CaO	Total	B2O3*
1	0.00	0.04	0.02	0.11	74.35	6.78	3.89	0.71	8.19	94.09	4.91
2	0.00	0.04	0.09	0.19	75.15	6.80	3.85	0.73	8.20	95.04	3.96
3	0.00	0.03	0.08	0.10	74.13	6.72	3.95	0.73	8.21	93.96	5.04
4	0.08	0.06	0.01	0.19	74.99	6.76	3.95	0.72	8.25	95.01	3.99
5	0.00	0.08	0.00	0.11	75.16	6.75	3.97	0.73	8.22	95.02	3.98
6	0.05	0.00	0.08	0.22	75.62	6.83	3.88	0.70	8.17	95.55	3.45
7	0.02	0.02	0.06	0.09	75.12	6.78	3.81	0.74	8.21	94.86	4.14
8	0.00	0.01	0.21	0.20	75.36	6.93	3.95	0.71	8.18	95.55	3.45
9	0.04	0.00	0.07	0.12	75.63	7.07	3.94	0.70	8.24	95.82	3.18
10	0.05	0.02	0.07	0.19	75.57	6.98	4.03	0.68	8.24	95.82	3.18
11	0.00	0.07	0.11	0.20	74.90	6.63	3.90	0.70	8.22	94.73	4.27
Average	0.02	0.03	0.07	0.16	75.09	6.82	3.92	0.71	8.21	95.04	3.96
St.Dev	0.0292	0.0267	0.0568	0.0488	0.4899	0.1259	0.0613	0.0175	0.0256	0.6296	0.6296
MDL	0.1	0.17	0.12	0.02	0.05	0.00	0.02	0.02	0.03		

*Boron determined by difference

** Values below MDL. Results of ICP/MS analyses indicate 35,590, 70, and 34 mg/kg respectively

Note: The lead in the glass does not occur chemically al lead oxide (PbO), but is found as Pb+2 ions acting as network modifying cations filling large holes between each Si/O tetrahedron.

Table 3. Invitro Relative Bioavailability Results.

Kaiser Hill/Rocky Flats Leaded Glass

Rocky Flats	Lab #	Pb in bulk soil (mg/kg)	mass soil (g)	calc Pb #1	ICP/MS Pb (mg/l)	solution amt (l)	Pb% RBA
Outer Glass	1	70	1.002	0.07	0.144	0.1	**20.5**
Inner Glass (<250 microns)	2	615000	1.002	616.23	1879.000	0.1	**30.5**
Coarse Inner Glass(>1.0 cm)	3	615000	1.110	682.54	14.500	0.1	**0.2**

Cross-References and Laboratory Reports

Narrative Reference to	Laboratory Report	Date	Lab Sample ID No.
Sample 1	RFETS Inorganic Analysis Data Package	June 20, 2001	01C0160-001
Sample 2	"	"	01C0160-001 D
Sample 3	"	"	01C0160-002
Sample 4	"	"	01C0160-002
Sample 5	"	August 7, 2001	01CO183-001
Sample 6	"	"	01CO183-001 D
Sample 7	"	"	01CO183-002
Sample 8	"	"	01CO183-002 D

Designated laboratory reports are attached.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

INORGANIC ANALYSIS DATA PACKAGE

Cover Page

Lab Name: Rocky Flats SDG No : JUN13

QC Report Number : SD061301

Lab Sample ID's beginning with "X" are TCLP Extracts.

No.	Lab Sample ID.	APO Sample ID.	Description	COC Customer No.
1	01C0160-001	01C0160-001.001	Bldg. 777 Solid Sample	none
2	01C0160-001 D	01C0160-001.002	Bldg. 777 Solid Sample	none
3	01C0160-002	01C0160-002.001	Bldg. 777 Solid Sample	none
4	01C0160-002 D	01C0160-002.002	Bldg. 777 Solid Sample	none

Were ICP interelement corrections applied? (y/n): YES Were ICP background corrections applied? (Y/N): YES

Comments:

I have reviewed the following data for the Samples listed above.

Signature: RC Walk 6/20/01
Analytical Chemist Date

Signature: [illegible] 6/20/01
Independent Technical Reviewer Date

Leaded glass
20" long x 9.5 wide x 0.5" thick
Sample weighs 7 kilogram / 15.4 lbs

① Leached entire window 500 ml leachate
Leachate Divided into 2 samples – 001/001-D

② Window leached again
Leachate divided into 2 samples
002/002-D.

FAXED
JUN 20 2001

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Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0160-001 (Bldg. 777 Solid Sample)

Matrix: AQUEOUS SDG No: JUN13

Date Sampled: 06/13/2001 QC Report No: SD061301

Receipt Date: 06/13/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.46			06/19/2001 13:11	06/19/2001	P
Antimony	0.10	U		06/19/2001 13:11	06/19/2001	P
Arsenic	0.10	U		06/19/2001 13:11	06/19/2001	P
Barium	3.3			06/19/2001 13:11	06/19/2001	P
Beryllium	0.0050	U		06/19/2001 13:11	06/19/2001	P
Cadmium	0.010	U		06/19/2001 13:11	06/19/2001	P
Calcium	0.54	B		06/19/2001 13:11	06/19/2001	P
Chromium	0.050	U		06/19/2001 13:11	06/19/2001	P
Cobalt	0.050	U		06/19/2001 13:11	06/19/2001	P
Copper	0.050	U		06/19/2001 13:11	06/19/2001	P
Iron	0.14	B		06/19/2001 13:11	06/19/2001	P
Lead	50.			06/19/2001 13:11	06/19/2001	P
Magnesium	0.20	U		06/19/2001 13:11	06/19/2001	P
Manganese	0.010	U		06/19/2001 13:11	06/19/2001	P
Molybdenum	0.050	U		06/19/2001 13:11	06/19/2001	P
Nickel	0.040	U		06/19/2001 13:11	06/19/2001	P
Phosphorus	0.50	U		06/19/2001 13:11	06/19/2001	P
Selenium	0.10	U		06/19/2001 13:11	06/19/2001	P
Silver	0.030	U		06/19/2001 13:11	06/19/2001	P
Strontium	0.025	B		06/19/2001 13:11	06/19/2001	P
Thallium	0.10	U		06/19/2001 13:11	06/19/2001	P
Titanium	0.020	U		06/19/2001 13:11	06/19/2001	P
Vanadium	0.050	U		06/19/2001 13:11	06/19/2001	P
Zinc	0.085	B		06/19/2001 13:11	06/19/2001	P

Color Before: colorless Clarity Before: clear

Color After: colorless Clarity After: clear

Texture: Artifacts:

Comments:

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Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0160-001 D (Bldg. 777 Solid Sample)

Matrix: AQUEOUS **SDG No:** JUN13

Date Sampled: 06/13/2001 **QC Report No:** SD061301

Receipt Date: 06/13/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.37	B		06/19/2001 13:23	06/19/2001	P
Antimony	0.10	U		06/19/2001 13:23	06/19/2001	P
Arsenic	0.10	U		06/19/2001 13:23	06/19/2001	P
Barium	3.2			06/19/2001 13:23	06/19/2001	P
Beryllium	0.0050	U		06/19/2001 13:23	06/19/2001	P
Cadmium	0.010	U		06/19/2001 13:23	06/19/2001	P
Calcium	0.43	B		06/19/2001 13:23	06/19/2001	P
Chromium	0.050	U		06/19/2001 13:23	06/19/2001	P
Cobalt	0.050	U		06/19/2001 13:23	06/19/2001	P
Copper	0.050	U		06/19/2001 13:23	06/19/2001	P
Iron	0.11	B		06/19/2001 13:23	06/19/2001	P
Lead	49.			06/19/2001 13:23	06/19/2001	P
Magnesium	0.20	U		06/19/2001 13:23	06/19/2001	P
Manganese	0.010	U		06/19/2001 13:23	06/19/2001	P
Molybdenum	0.050	U		06/19/2001 13:23	06/19/2001	P
Nickel	0.040	U		06/19/2001 13:23	06/19/2001	P
Phosphorus	0.50	U		06/19/2001 13:23	06/19/2001	P
Selenium	0.10	U		06/19/2001 13:23	06/19/2001	P
Silver	0.030	U		06/19/2001 13:23	06/19/2001	P
Strontium	0.024	B		06/19/2001 13:23	06/19/2001	P
Thallium	0.10	B		06/19/2001 13:23	06/19/2001	P
Titanium	0.020	U		06/19/2001 13:23	06/19/2001	P
Vanadium	0.050	U		06/19/2001 13:23	06/19/2001	P
Zinc	0.078	B		06/19/2001 13:23	06/19/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

33

Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0160-002 (Bldg. 777 Solid Sample)

Matrix: AQUEOUS **SDG No:** JUN13

Date Sampled: 06/13/2001 **QC Report No:** SD061301

Receipt Date: 06/13/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.27	B		06/19/2001 13:33	06/19/2001	P
Antimony	0.10	U		06/19/2001 13:33	06/19/2001	P
Arsenic	0.10	U		06/19/2001 13:33	06/19/2001	P
Barium	1.6			06/19/2001 13:33	06/19/2001	P
Beryllium	0.0050	U		06/19/2001 13:33	06/19/2001	P
Cadmium	0.010	U		06/19/2001 13:33	06/19/2001	P
Calcium	0.20	U		06/19/2001 13:33	06/19/2001	P
Chromium	0.050	U		06/19/2001 13:33	06/19/2001	P
Cobalt	0.050	U		06/19/2001 13:33	06/19/2001	P
Copper	0.050	U		06/19/2001 13:33	06/19/2001	P
Iron	0.10	U		06/19/2001 13:33	06/19/2001	P
Lead	24.			06/19/2001 13:33	06/19/2001	P
Magnesium	0.20	U		06/19/2001 13:33	06/19/2001	P
Manganese	0.010	U		06/19/2001 13:33	06/19/2001	P
Molybdenum	0.050	U		06/19/2001 13:33	06/19/2001	P
Nickel	0.040	U		06/19/2001 13:33	06/19/2001	P
Phosphorus	0.50	U		06/19/2001 13:33	06/19/2001	P
Selenium	0.10	U		06/19/2001 13:33	06/19/2001	P
Silver	0.030	U		06/19/2001 13:33	06/19/2001	P
Strontium	0.011	B		06/19/2001 13:33	06/19/2001	P
Thallium	0.31			06/19/2001 13:33	06/19/2001	P
Titanium	0.020	U		06/19/2001 13:33	06/19/2001	P
Vanadium	0.050	U		06/19/2001 13:33	06/19/2001	P
Zinc	0.050	U		06/19/2001 13:33	06/19/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

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Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0160-002 D (Bldg. 777 Solid Sample)

Matrix: AQUEOUS **SDG No:** JUN13

Date Sampled: 06/13/2001 **QC Report No:** SD061301

Receipt Date: 06/13/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.50			06/19/2001 13:35	06/19/2001	P
Antimony	0.10	U		06/19/2001 13:35	06/19/2001	P
Arsenic	0.10	U		06/19/2001 13:35	06/19/2001	P
Barium	1.8			06/19/2001 13:35	06/19/2001	P
Beryllium	0.0050	U		06/19/2001 13:35	06/19/2001	P
Cadmium	0.010	U		06/19/2001 13:35	06/19/2001	P
Calcium	0.20	U		06/19/2001 13:35	06/19/2001	P
Chromium	0.050	U		06/19/2001 13:35	06/19/2001	P
Cobalt	0.050	U		06/19/2001 13:35	06/19/2001	P
Copper	0.050	U		06/19/2001 13:35	06/19/2001	P
Iron	0.10	U		06/19/2001 13:35	06/19/2001	P
Lead	27.			06/19/2001 13:35	06/19/2001	P
Magnesium	0.20	U		06/19/2001 13:35	06/19/2001	P
Manganese	0.010	U		06/19/2001 13:35	06/19/2001	P
Molybdenum	0.050	U		06/19/2001 13:35	06/19/2001	P
Nickel	0.040	U		06/19/2001 13:35	06/19/2001	P
Phosphorus	0.50	U		06/19/2001 13:35	06/19/2001	P
Selenium	0.10	U		06/19/2001 13:35	06/19/2001	P
Silver	0.030	U		06/19/2001 13:35	06/19/2001	P
Strontium	0.011	B		06/19/2001 13:35	06/19/2001	P
Thallium	0.10	U		06/19/2001 13:35	06/19/2001	P
Titanium	0.020	U		06/19/2001 13:35	06/19/2001	P
Vanadium	0.050	U		06/19/2001 13:35	06/19/2001	P
Zinc	0.050	U		06/19/2001 13:35	06/19/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

INORGANIC ANALYSIS DATA PACKAGE

Cover Page

Lab Name: Rocky Flats

SDG No : JUL30

QC Report Number : SD073001

Lab Sample ID's beginning with "X" are TCLP Extracts.

No.	Lab Sample ID.	APO Sample ID.	Description		COC Customer No.
1	01C0183-001	01C0183-001.001	Bldg. 777 Solid Sample	New window/gasket	none
2	01C0183-001D	01C0183-001.002	Bldg. 777 Solid Sample	New window/gasket	none
3	01C0183-002	01C0183-002.001	Bldg. 777 Solid Sample	old window/gasket 707	none
4	01C0183-002D	01C0183-002.002	Bldg. 777 Solid Sample	old window/gasket 707	none

Were ICP interelement corrections applied? (y/n): YES

Were ICP background corrections applied? (Y/N): YES

Comments:

I have reviewed the following data for the Samples listed above.

Signature: RC-Kelly — **Analytical Chemist** — **Date** 8/7/01

Signature: _____ — **Independent Technical Reviewer** — **Date** _____

A-1

Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0183-001 (Bldg. 777 Solid Sample) New GB window + gasket

Matrix: AQUEOUS **SDG No:** JUL30

Date Sampled: 07/30/2001 **QC Report No:** SD073001

Receipt Date: 07/30/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.40	U		08/07/2001 13:10	08/06/2001	P
Antimony	0.20	U		08/07/2001 13:10	08/06/2001	P
Arsenic	0.20	U		08/07/2001 13:10	08/06/2001	P
Barium	0.10	U		08/07/2001 13:10	08/06/2001	P
Beryllium	0.010	U		08/07/2001 13:10	08/06/2001	P
Cadmium	0.020	U		08/07/2001 13:10	08/06/2001	P
Calcium	19.	B		08/07/2001 13:10	08/06/2001	P
Chromium	0.10	U		08/07/2001 13:10	08/06/2001	P
Cobalt	0.10	U		08/07/2001 13:10	08/06/2001	P
Copper	0.68		*	08/07/2001 13:10	08/06/2001	P
Iron	2.8			08/07/2001 13:10	08/06/2001	P
Lead	0.30		*	08/07/2001 13:10	08/06/2001	P
Magnesium	3.3	B		08/07/2001 13:10	08/06/2001	P
Manganese	0.021	B		08/07/2001 13:10	08/06/2001	P
Molybdenum	0.10	U		08/07/2001 13:10	08/06/2001	P
Nickel	0.080	U		08/07/2001 13:10	08/06/2001	P
Phosphorus	2.1			08/07/2001 13:10	08/06/2001	P
Selenium	0.20	U		08/07/2001 13:10	08/06/2001	P
Silver	0.060	U		08/07/2001 13:10	08/06/2001	P
Strontium	0.036	B		08/07/2001 13:10	08/06/2001	P
Thallium	0.20	U		08/07/2001 13:10	08/06/2001	P
Titanium	0.040	U		08/07/2001 13:10	08/06/2001	P
Vanadium	0.10	U		08/07/2001 13:10	08/06/2001	P
Zinc	7.2		E	08/07/2001 13:10	08/06/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

Form 1

A-1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats New GB window / Gasket

Lab Sample ID: 01C0183-001D (Bldg. 777 Solid Sample)

Matrix: AQUEOUS **SDG No:** JUL30

Date Sampled: 07/30/2001 **QC Report No:** SD073001

Receipt Date: 07/30/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.40	U		08/07/2001 13:18	08/06/2001	P
Antimony	0.20	U		08/07/2001 13:18	08/06/2001	P
Arsenic	0.20	U		08/07/2001 13:18	08/06/2001	P
Barium	0.10	U		08/07/2001 13:18	08/06/2001	P
Beryllium	0.010	U		08/07/2001 13:18	08/06/2001	P
Cadmium	0.020	U		08/07/2001 13:18	08/06/2001	P
Calcium	21.			08/07/2001 13:18	08/06/2001	P
Chromium	0.10	U		08/07/2001 13:18	08/06/2001	P
Cobalt	0.10	U		08/07/2001 13:18	08/06/2001	P
Copper	0.10	U	*	08/07/2001 13:18	08/06/2001	P
Iron	3.1			AK 08/07/2001 13:18	08/06/2001	P
Lead	0.10	U	*	8/7/01 08/07/2001 13:18	08/06/2001	P
Magnesium	3.6	B		08/07/2001 13:18	08/06/2001	P
Manganese	0.025	B		08/07/2001 13:18	08/06/2001	P
Molybdenum	0.10	U		08/07/2001 13:18	08/06/2001	P
Nickel	0.080	U		08/07/2001 13:18	08/06/2001	P
Phosphorus	2.3			08/07/2001 13:18	08/06/2001	P
Selenium	0.20	U		08/07/2001 13:18	08/06/2001	P
Silver	0.060	U		08/07/2001 13:18	08/06/2001	P
Strontium	0.036	B		08/07/2001 13:18	08/06/2001	P
Thallium	0.20	U		08/07/2001 13:18	08/06/2001	P
Titanium	0.040	U		08/07/2001 13:18	08/06/2001	P
Vanadium	0.10	U		08/07/2001 13:18	08/06/2001	P
Zinc	7.6		E	08/07/2001 13:18	08/06/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

B1, B707

Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0183-002 (Bldg. 777 Solid Sample) B707 old GB window gasket

Matrix: AQUEOUS **SDG No:** JUL30

Date Sampled: 07/30/2001 **QC Report No:** SD073001

Receipt Date: 07/30/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.40	U		08/07/2001 13:29	08/06/2001	P
Antimony	0.20	U		08/07/2001 13:29	08/06/2001	P
Arsenic	0.20	U		08/07/2001 13:29	08/06/2001	P
Barium	0.12	B		08/07/2001 13:29	08/06/2001	P
Beryllium	0.010	U		08/07/2001 13:29	08/06/2001	P
Cadmium	0.020	U		08/07/2001 13:29	08/06/2001	P
Calcium	7.3	B		08/07/2001 13:29	08/06/2001	P
Chromium	0.10	U		08/07/2001 13:29	08/06/2001	P
Cobalt	0.10	U		08/07/2001 13:29	08/06/2001	P
Copper	0.39		*	08/07/2001 13:29	08/06/2001	P
Iron	0.78			08/07/2001 13:29	08/06/2001	P
Lead	2.8		*	08/07/2001 13:29	08/06/2001	P
Magnesium	5.5	B		08/07/2001 13:29	08/06/2001	P
Manganese	0.033	B		08/07/2001 13:29	08/06/2001	P
Molybdenum	0.10	U		08/07/2001 13:29	08/06/2001	P
Nickel	0.080	U		08/07/2001 13:29	08/06/2001	P
Phosphorus	1.3	B		08/07/2001 13:29	08/06/2001	P
Selenium	0.20	U		08/07/2001 13:29	08/06/2001	P
Silver	0.060	U		08/07/2001 13:29	08/06/2001	P
Strontium	0.020	U		08/07/2001 13:29	08/06/2001	P
Thallium	0.23	B		08/07/2001 13:29	08/06/2001	P
Titanium	0.040	U		08/07/2001 13:29	08/06/2001	P
Vanadium	0.10	U		08/07/2001 13:29	08/06/2001	P
Zinc	3.1		E	08/07/2001 13:29	08/06/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

B1, B707

Form 1

INORGANIC ANALYSIS DATA SHEET

Lab Name: Rocky Flats

Lab Sample ID: 01C0183-002D (Bldg. 777 Solid Sample) OLD GB window with Gasket B707

Matrix: AQUEOUS **SDG No:** JUL30

Date Sampled: 07/30/2001 **QC Report No:** SD073001

Receipt Date: 07/30/2001

% Solids n/a

Elements Identified and Measured

Analyte	Concentration (mg/L)	C	Q	Date/Time Analyzed	Prep Date	M
Aluminum	0.40	U		08/07/2001 13:31	08/06/2001	P
Antimony	0.20	U		08/07/2001 13:31	08/06/2001	P
Arsenic	0.20	U		08/07/2001 13:31	08/06/2001	P
Barium	0.10	U		08/07/2001 13:31	08/06/2001	P
Beryllium	0.010	U		08/07/2001 13:31	08/06/2001	P
Cadmium	0.020	U		08/07/2001 13:31	08/06/2001	P
Calcium	7.0	B		08/07/2001 13:31	08/06/2001	P
Chromium	0.10	U		08/07/2001 13:31	08/06/2001	P
Cobalt	0.10	U		08/07/2001 13:31	08/06/2001	P
Copper	0.29		*	08/07/2001 13:31	08/06/2001	P
Iron	0.72			08/07/2001 13:31	08/06/2001	P
Lead	2.7		*	08/07/2001 13:31	08/06/2001	P
Magnesium	5.2	B		08/07/2001 13:31	08/06/2001	P
Manganese	0.020	U		08/07/2001 13:31	08/06/2001	P
Molybdenum	0.10	U		08/07/2001 13:31	08/06/2001	P
Nickel	0.080	U		08/07/2001 13:31	08/06/2001	P
Phosphorus	1.0	U		08/07/2001 13:31	08/06/2001	P
Selenium	0.20	U		08/07/2001 13:31	08/06/2001	P
Silver	0.060	U		08/07/2001 13:31	08/06/2001	P
Strontium	0.020	U		08/07/2001 13:31	08/06/2001	P
Thallium	0.20	U		08/07/2001 13:31	08/06/2001	P
Titanium	0.040	U		08/07/2001 13:31	08/06/2001	P
Vanadium	0.10	U		08/07/2001 13:31	08/06/2001	P
Zinc	3.0		E	08/07/2001 13:31	08/06/2001	P

Color Before: colorless **Clarity Before:** clear

Color After: colorless **Clarity After:** clear

Texture: **Artifacts:**

Comments:

Enabling Technology, Inc **RFETS**	**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**	C.O.C. # **01C0183#001** Page 1 of 1

Sampler(s) (time/date)	Contact/Requester TRICE, CONRAD/BOB CATHEL	Telephone No. 2490/6880
RIN 01C0183	Sampling Origin B777	Purchase Order/Charge Code DAD01ANA
Project Title B776/777, LEADED GLASS, B777, R254	Logbook No. N/A	Ice Chest No. N/A Temp. NA
To (Lab) Building 559 Laboratory	Method of Shipment Hand Carry	Bill of Lading/Air Bill No.
Protocol	Related COC (if any)	PRE N/A

POSSIBLE SAMPLE HAZARDS/REMARKS
Are acid preserved samples DOT hazardous per 40 CFR Part 136.3 Table II? YES or NO
Are other known hazardous substances present? YES or NO
** ** **

SCREENING REQUIRED ☐

SPECIAL INSTRUCTIONS **Hold Time**

Bottle No.	Customer Number	Matrix	Date	Time	Location	Container (size/type/quantity)	Sample Analysis	Preservative ; Packing
01C0183-001.001	A1	SOLID	7/30/01	1430		500-G / N/A /1	RS08A008 (TCLP Metals w/o Hg SW846 1311) PRIORITY ~~[Rush]~~	None None
01C0183-001.002	A1	SOLID	↓	↓		500-G / N/A /1	RS08A008 (TCLP Metals w/o Hg SW846 1311) PRIORITY ~~[Rush]~~	None None
01C0183-002.001	B1, B707	SOLID	↓	↓		500-G / N/A /1	RS08A008 (TCLP Metals w/o Hg SW846 1311) PRIORITY ~~[Rush]~~	None None
01C0183-002.002	B1, B707	SOLID	↓	↓		500-G / N/A /1	RS08A008 (TCLP Metals w/o Hg SW846 1311) PRIORITY [Rush]	None None

Relinquished By:	Date/Time	Received By:	Date/Time	Relinquished By:	Date/Time	Received By:	Date/Time
Conrad Trice	7/30/1430	PB Johnson	7/30/01 1430				

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., returned to customer, disposed of per lab procedure, used in analytical process)	Disposed By	Date/Time

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